

L AND M PRESSURE CONTACTORS

DESCRIPTION AND INSTALLATION

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2. DESCRIPTION

2.01 The L pressure contactor differs from the M pressure contactor as follows:

- The *L pressure contactor* (Fig. 1) is equipped with a 6-foot length of tinned-copper tubing for making pneumatic connection to the pressurized cable. An aluminum bracket is attached to the back of the housing for mounting the contactor on a pole or wall. Two No. 12 by 2-inch long wood screws are furnished for mounting.

1. GENERAL

1.01 This section covers the description, installation, and adjustment of the L and M pressure contactors designed for use on aerial subscriber cables.

1.02 This section is revised to include information formerly covered in Section 637-214-200 and to delete information pertaining to the B end point contactor. Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The L and M pressure contactors replace the B end point contactor. The superseded B end point contactor is covered in Section 637-210-100.

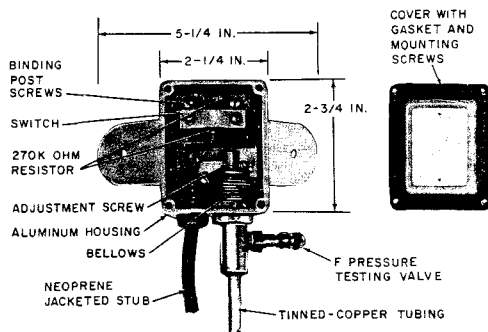


Fig. 1—L Pressure Contactor With Dual Resistors—Front View

**Reprinted to comply with modified final judgment.

- The *M pressure contactor* (Fig. 2) is equipped with a pipe threaded fitting on the back of the housing to permit making a direct pneumatic connection to the cable sleeve or sheath. A cadmium-plated elbow also is packaged with each contactor for use where a mounting is to be made to a splice case.

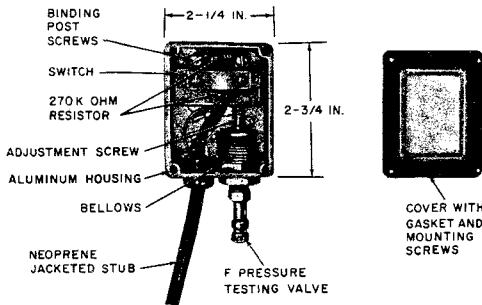


Fig. 2—M Pressure Contactor With Dual Resistors

2.02 L and M pressure contactors are weatherproof but not watertight, and therefore *should not* be installed in manholes.

2.03 Both contactors consist essentially of:

- An electrical switch (Micro-Switch) which operates as air pressure causes expansion and contraction of a bellows arrangement.
- A high resistance network connected to the switch contacts
- A 6-foot length of 18-gauge, 2-conductor, neoprene-covered stub for connecting the resistance network to the binding posts of a cable pair at a distribution terminal.

2.04 On present contactors, identified by a yellow tape marker on the stub adjacent to the housing, the resistance network consists of two 270K-ohm resistors connected in series, as shown in Fig. 3, and arranged so that:

- *When the contactor is not operated*, a total of 540K ohms resistance is bridged across the subscriber line. This permits ready verification from the test center that the contactor is properly connected to its assigned cable pair.
- *When the contactor is operated*, the Micro-Switch shorts out one of the two resistors, leaving a 270K-ohm resistance across the line.

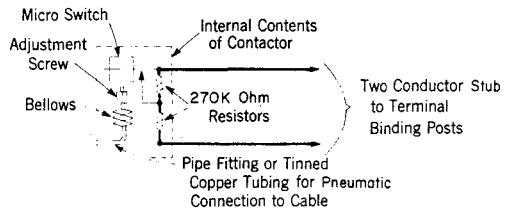


Fig. 3—Schematic of L or M Pressure Contactor With Dual Resistors

2.05 On older contactors, the resistance network consists of a single 270K-ohm resistor connected in series with the switch contacts, as shown in Fig. 4. With this arrangement, the 270K-ohm resistor is placed across the subscriber line only when the contactor has operated. Therefore, it is *not possible* to verify from the test center the proper connection of an *unoperated* contactor. The procedure for converting these contactors to dual resistor operation is covered in Part 4.

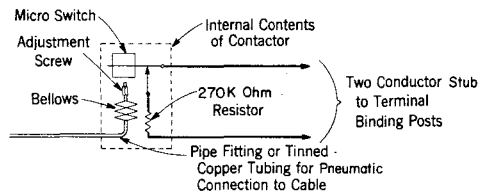


Fig. 4—Schematic of L or M Pressure Contactor With Single Resistor

2.06 These contactors preferably should be connected to a 1-party line. However, a 2-, 4-, or 8-party line may be used. The contactor should not be connected to special service lines or lines feeding open wire extensions. The 270K- or 540K-ohm resistance will not affect the operation of an ordinary subscriber line. The cable pair to be used for contactor connection will be indicated on the work order or print.

2.07 If L or M contactors are multiplied across the same cable pair, an operated contactor is identified by loop resistance measurements from the test desk (without CPMS) or automatically from the remote terminal (with CPMS) to the operated contactor. Up to 10 contactors may be bridged on a given pair when CPMS is employed. Identification of the operated contactor is possible by maintaining a minimum loop resistance difference of 100 ohms between adjacent contactors.

2.08 Contactors must be tested at frequent intervals to monitor the pressure conditions at the contactor locations. It is expected that these tests will be made on a scheduled basis that will vary with the type of test arrangement used at the office or test center.

3. LOCATION OF CONTACTOR

3.01 The L or M pressure contactor can be connected to the cable at any terminal location where the stabilized *normal cable pressure* is at least 2.0 psi.

3.02 The recommended minimum requirements for contactor locations are as follows:

- (a) At the end of each 600 pairs or larger cable that extends from the underground system*

- (b) At the riser pole where the cable from the underground system is less than 600 pairs.*

*Except that contactors should not be located closer to each other than 5 units of pneumatic resistance.

3.03 Additional protection can be obtained for subscriber cable by placing contactors, as pressures are improved, at locations that will permit monitoring to the end of all feeder cables, and ultimately to the end of all pressurized branches.

3.04 Records of contactor locations and their operating pressure settings must be maintained at the location from which the tests are made. Tests should be made between 8:00 and 9:00 A.M., or if local arrangements permit, during the early morning or evening hours because the cables being monitored will be essentially aerial and therefore more subject to pressure changes resulting from temperature variations. Records also should indicate whether contactors are of dual or single resistor type.

4. CONVERTING CONTACTOR FOR DUAL RESISTANCE OPERATION

4.01 Kits are available for converting the older L and M pressure contactors for dual resistor operation. This kit is ordered as follows:

Kit, Conversion, B-650381.

4.02 The conversion kit consists of a 270K-ohm resistor with spade-clipped wire leads and a patch of yellow pressure-sensitive tape for identification purposes.

4.03 Convert L or M pressure contactors to dual resistor operation as follows:

- (a) Disconnect the contactor conductors from the cable terminal binding posts.
- (b) Remove the contactor housing cover and loosen the two brass binding post screws. (Do not remove screws from mounting.) See Fig. 5.

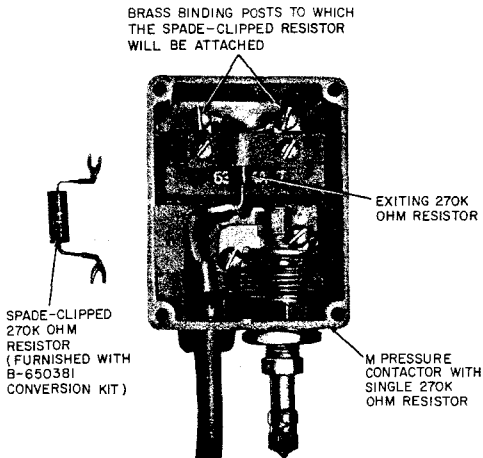


Fig. 5—Converting L or M Pressure Contactor to Dual Resistor Arrangement

- (c) Place the spade clips of the resistor (from the B-650381 conversion kit) under the binding post screws and tighten securely.
- (d) Remove the paper backing from the yellow tape and apply the tape to the contactor conductor immediately adjacent to the contactor housing. This will indicate that the contactor is arranged for dual resistor operation.
- (e) Check for contactor operation as described in Part 6.
- (f) Replace the contactor housing cover and reconnect the contactor to the terminal binding posts.

5. INSTALLATION OF CONTACTOR

5.01 Prior to contactor installation, obtain an average of three pressure readings at the contactor location. If a valve is not already in place, a flange should be installed on the sleeve and the pressure readings taken with a C cable drill to avoid any pressure loss. However, after obtaining the pressure reading with a C cable drill, an F valve or C pressure flange plug should be placed in the existing flange if the contactor is not to be installed immediately.

5.02 Where the contactor is to be connected to a splice case rather than a lead sleeve, a valve will have to be installed in the case and the pressure allowed to rebuild for at least 15 minutes before the initial pressure reading is taken.

5.03 It is recommended that the contactor setting be approximately 1.0 psi below the stabilized normal pressure, as read between 8:00 and 9:00 A.M., preferably on a cloudy day.

5.04 The first time the contactor operates after it is installed, as determined by routine checking from the test center or automatically with CPMS, the operation should be verified at a common time period. This common time period for checking contactor operation and original pressure reading for contactor setting is to reduce the possibility of covering a contactor operation resulting from temperature change alone. A listing of typical pressure variations due to temperature changes is shown in Table A.

TABLE A
TYPICAL PRESSURE VARIANCE
DUE TO TEMPERATURE CHANGE

TIME	CABLE PRESSURE AT CONTACTOR LOCATION (PSI)	TEMPERATURE (°F)
12:00 Midnight	1.95	50
3:00 A.M.	1.90	49
6:00 A.M.	2.00	56
9:00 A.M.	2.50	65
12:00 Noon	2.80	70
3:00 P.M.	2.90	69
6:00 P.M.	2.50	60
9:00 P.M.	2.30	55

L Pressure Contactor

5.05 Under some conditions, contactor mounting on a pole or wall may be preferable in order to make the contactor more accessible. Refer to Fig. 6 through 10 for typical examples of mounting the L pressure contactor.

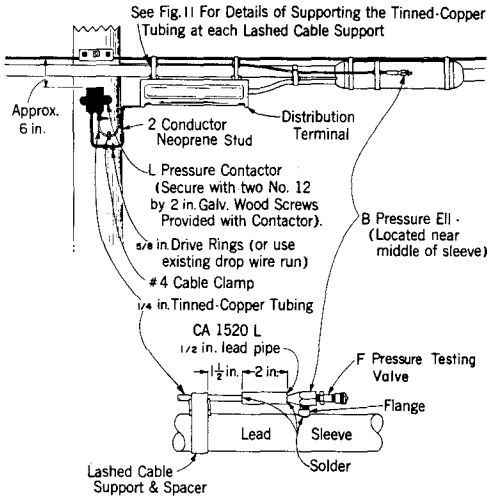


Fig. 6—Strand-Mounted Terminal

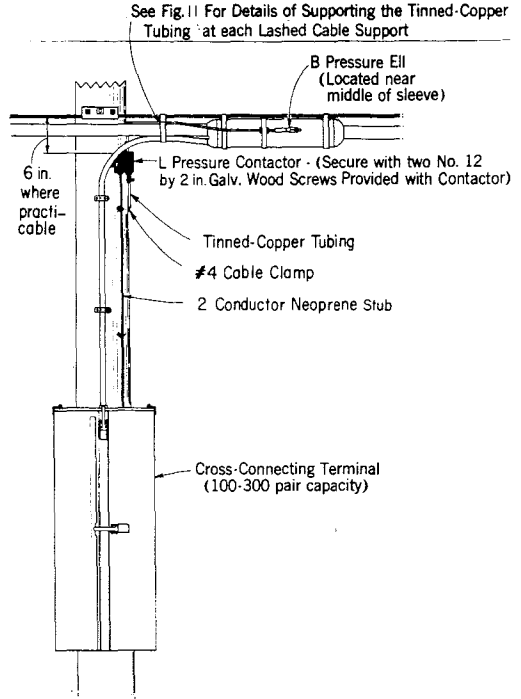


Fig. 8—Cross-Connecting Terminal (100- to 300-Pair Capacity)

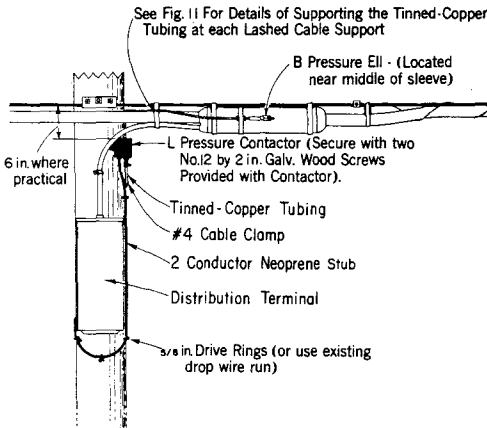


Fig. 7—Pole-Mounted Terminal

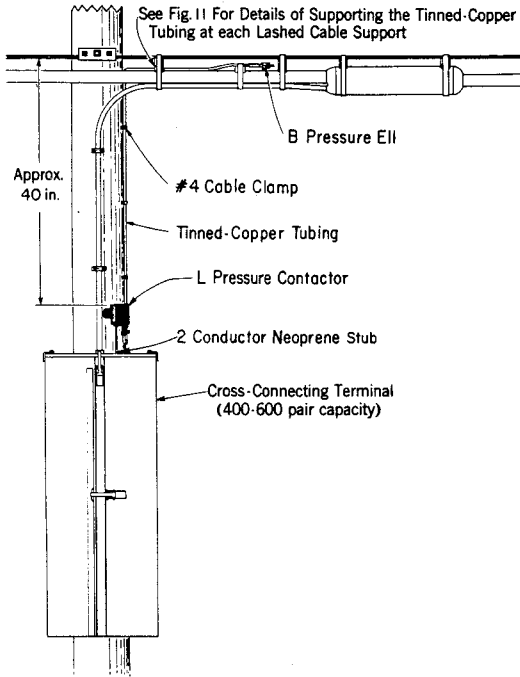


Fig. 9—Cross-Connecting Terminal (400- to 600-Pair Capacity)

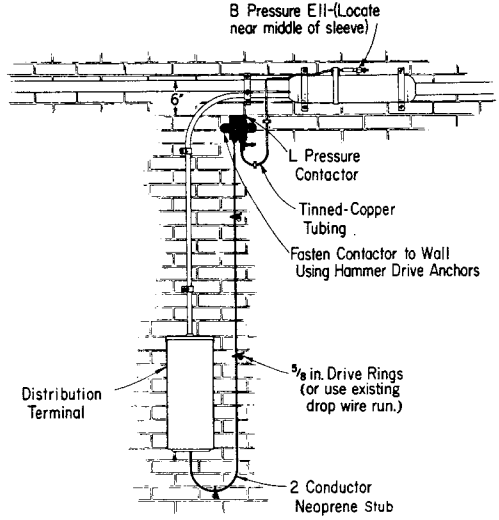


Fig. 10—Wall-Mounted Terminal

5.06 Cross-Connecting Terminal—(400- to 600-Pair Capacity): When the L pressure contactor is installed at the location of a 400- or 600-pair cross-connecting terminal, as shown in Fig. 9, it may be necessary to place the B pressure ell on the cable sheath, also illustrated in Fig. 9. This installation procedure is necessary to permit the standard lengths of copper tubing and 2-conductor cord of the contactor to reach their respective terminating points.

5.07 The tinned copper tubing extending from the contactor to its terminating point on the lead sleeve should be supported at each lashed cable support, using the method shown in Fig. 11.

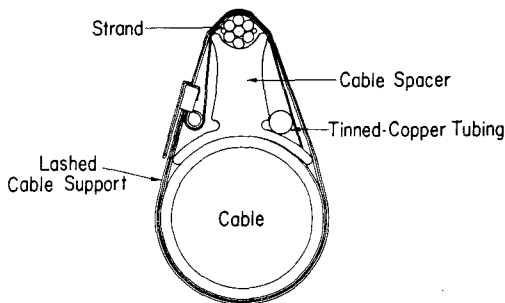


Fig. 11—Supporting Tinned-Copper Tubing

5.08 Remove the valve used for making the pressure readings and install a B pressure ell in the flange on the sleeve or in the splice case to connect the tinned-copper tubing.

5.09 Form the tinned-copper tubing from the contactor to meet the B pressure ell. Where there is an excessive length of tubing, it should be cut back with a tube cutter or hacksaw. If a hacksaw is used for this operation, all metal chips must be removed from the tubing.

5.10 Make a soldered joint connection between the B pressure ell and the tubing, using a 2-inch length of CA-1520L lead pipe as illustrated in Fig. 6.

5.11 Where the tinned-copper tubing or 2-conductor cord of the contactor lacks sufficient length to reach its terminating point, an extension should be placed on either the tubing or the cord, depending on the following:

(a) An extension can be soldered to the tinned-copper tubing if additional tinned-copper tubing is available. However, copper tubing which is not tinned should be avoided. The copper tubing joint is made by connecting the two ends of copper tubing with a 2-inch length of CA-1520L lead pipe and soldering.

(b) A length of CA-1520L lead pipe can be used to extend the copper tubing. Make a soldered joint connection between the tinned-copper tubing and the lead pipe.

(c) The 2-conductor neoprene cord from the contactor can be terminated in a 101B wire terminal, and a drop wire extended from the wire terminal to the binding post of the distribution or cross-connecting terminal.

M Pressure Contactor

5.12 In most cases, the M pressure contactor will permit a simpler installation than can be made with the pole- or wall-mounted type of contactor.

5.13 At each installation of an M pressure contactor, a separate F pressure-testing valve also must be placed. This valve is used in decreasing or increasing the cable pressure during adjustment. Reading and bleeding from a single valve will not permit proper adjustment of the contactor.

5.14 Installation at a Sleeve: Where the contactor installation is to be made on a sleeve, it is necessary to place two C pressure flanges; one for mounting the contactor and the other for mounting the F pressure-testing valve. The pipe threads on the valve and the pipe fitting of the contactor must be coated with thread compound before inserting into the flanges. A typical installation on a sleeve is shown in Fig. 12.

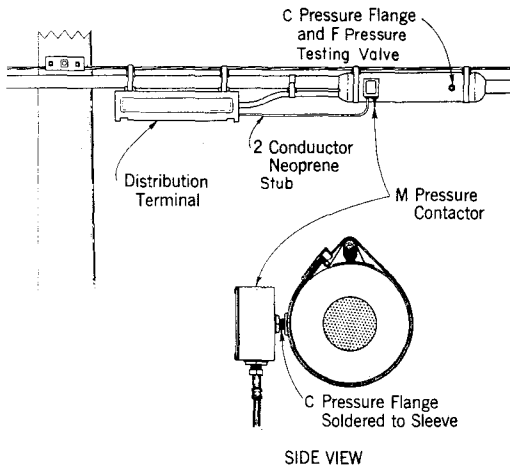


Fig. 12—M Pressure Contactor Installed on a Sleeve

5.15 Installation at a Splice Case with a T- or 61-Type Terminal: Where the contactor installation is to be made at a splice case, remove the pipe plugs from the pressure-testing flanges on the splice case and the terminal. The street elbow furnished with the contactor is required with this installation to provide adequate clearance from the strand and splice case. Coat the pipe threads on the F pressure-testing valve on the pipe fitting of the contactor, and the male end of the street elbow with thread compound. Install the valve stem in the pressure-testing flange of the terminal. Install the street elbow in the pressure-testing flange of the splice case, and then screw the contactor into the street elbow. A typical installation at a splice case is shown in Fig. 13.

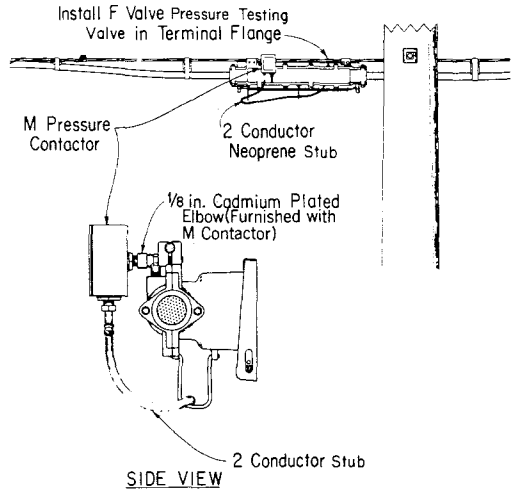


Fig. 13—M Pressure Contactor Installed At a Splice Case

5.16 At other locations such as pole-mounted distribution terminals or cross-connecting terminals, the M pressure contactor may be installed similarly in a flange on the lead sleeve.

6. SETTING AND ADJUSTING PROCEDURES

6.01 As supplied, the L or M pressure contactor is set to operate at 2 psi of falling pressure. The contactors can be adjusted, however, to operate at any pressure between 1 and 10 psi. The method of adjustment is the same for both types of contactors.

6.02 Normally, the contactor will require adjustment for the original setting. Subsequent readjustment may be required as the cable pressure changes due to conditioning of the cable system or additions of cable to the system.

6.03 The following tools and equipment are necessary to adjust a contactor:

- 1/4-inch open-end wrench (such as 417A tool)
- Screwdriver (3-inch cabinet)

- C pressure gauge
- KS-8455 test set or a headset and 4.5-volt battery
- Nitrogen cylinder and a pressure-testing regulator.

6.04 The C pressure gauge is used instead of a mercury manometer for contactor adjustment because of its quick response to pressure change. A quick gauge response to pressure change is necessary in order to make a precise contactor adjustment.

6.05 Procedure for Adjusting the Contactor:

The following steps are necessary to adjust a contactor:

(1) Remove the four screws holding the contactor coverplate, and remove the coverplate and gasket.

(2) Move the hex head of the adjustment screw 1/6 turn clockwise for each 1/2-pound increase in operating pressure, and 1/6 turn counterclockwise for each 1/2-pound decrease in operating pressure. One complete revolution of the adjustment screw will increase or decrease the contactor operating pressure by approximately 3 psi. A 1/4-inch open-end wrench is used to turn the adjustment screw.

(3) After installing the contactor, it may be necessary to rebuild the cable pressure with nitrogen for contactor adjustment purposes. The following items describe this procedure:

(a) Connect a pressure-testing hose and chuck from a nitrogen cylinder to the valve that was installed in the sleeve, splice case, or B pressure ell. For convenience, this valve will be termed the "control" valve.

(b) Connect a C pressure gauge to the valve on the contactor. This will provide a means of indicating when the cable has been recharged above the normal cable pressure. The arrangement for use with an L pressure contactor is shown in Fig. 14. The arrangement for use with the M pressure contactor differs only in that the "control" valve is installed in the sleeve or the splice case rather than in the B pressure ell.

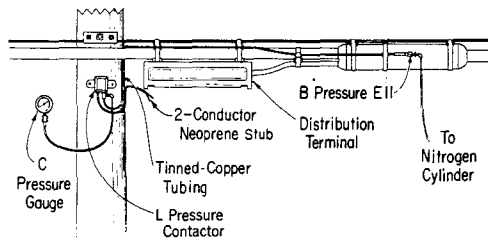


Fig. 14—Use of C Pressure Gauge

(4) Connect a KS-8455 test set, using the ohmmeter circuit, to the binding posts of the Micro-Switch, as shown in Fig. 15, or a 4.5-volt battery and a headset as shown in Fig. 16. Operation of the contactor is indicated by full-scale deflection of the test set needle, or by an audible click in the headset.

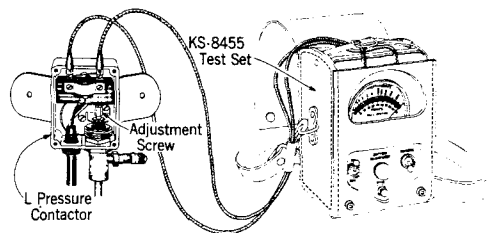


Fig. 15—Test Arrangement Using KS-8455 Test Set

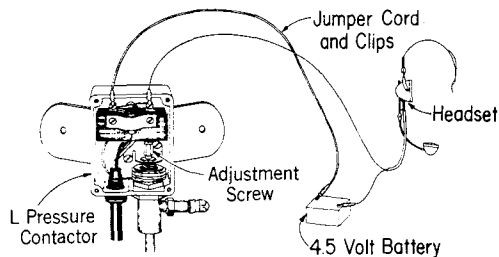


Fig. 16—Test Arrangement Using Battery and Headset

(5) When the cable pressure has rebuilt to a point above the normal cable pressure, as indicated on the C pressure gauge, the following contactor adjustment procedures are necessary:

- (a) If a nitrogen gas cylinder has been used to rebuild the cable pressure, disconnect it from the control valve when pressure has been rebuilt.
 - (b) Bleed the control valve carefully, using the top of the valve cap, until the Micro-Switch closes, as indicated either by the test set needle deflection or a click in the headset.
 - (c) On the C pressure gauge, note the pressure at which the contactor operated.
 - (d) Turn the contactor adjusting screw clockwise or counterclockwise as required to obtain the proper setting.
 - (e) Allow the cable pressure to rebuild until the contactor clears, as determined by either the test set needle returning to normal or by an audible click in the headset. Where necessary, connect a nitrogen cylinder to rebuild the pressure.
 - (f) Bleed the control valve carefully again, until an indication is obtained either from test set needle deflection or by an audible click in the headset. Readjust the contactor, if necessary, until correct operating value has been obtained.
- (6) After the contactor has been adjusted, allow the cable pressure to rebuild and then bleed the control valve on the ell for final check on correct operation of the contactor. Even if the contactor is adjusted for correct operation on the first attempt, repeat this procedure of bleeding and rebuilding at least two times to verify the setting and functioning of the contactor.

(7) Terminate the two wires of the neoprene-jacketed contactor stub on the assigned cable terminal binding posts.

(8) Notify the test center of the pressure at which the contactor has been set and whether the contactor is arranged for single or dual resistor operation. Request a test on the cable pair to determine that:

- (a) With dual resistors, one of the resistors is short-circuited when the contactor operates but clears when the contactor restores. Approximately 540K ohms should be indicated across the line for a nonoperated and 270K ohms for an operated contactor.
- (b) With a single 270K-ohm resistor, the resistor is connected across the line for an operated contactor, but is open for a nonoperated contactor.

6.06 On new installations, it may be preferable at times to adjust the contactor or contactors on the ground before installation. This can be accomplished by connecting a length of pressure-testing hose from the regulator on the nitrogen cylinder to the contactor (see note below). Connect the C pressure gauge to the valve on the contactor, and connect either the KS-8455 test set or a 4.5-volt battery and headset, as described in 6.05. The contactor then can be adjusted as on an actual installation.

Note: With the L pressure contactor, the end of the pressure-testing hose can be slipped onto the end of the tinned-copper tubing. With the M pressure contactor, the best procedure is to install a 1/8-inch pipe coupling on the pipe fitting of the contactor. Next, place an F pressure-testing valve in the other end of the pipe coupling. The chuck of the pressure-testing hose then can be attached to the valve stem.